Title: RUMBLE STRIPS RESPONSIVE SYSTEMS Inventor(s): Hiroshi KAWAZOE et al. DOCKET NO.: 032915-0139 100 Brake control Unit To front brake units Audio Unit 180 ENG/AT Cont. Unit 120 Indicator 150 Brake SW 102 : G Sensor (Exemplary) To Brake control unit

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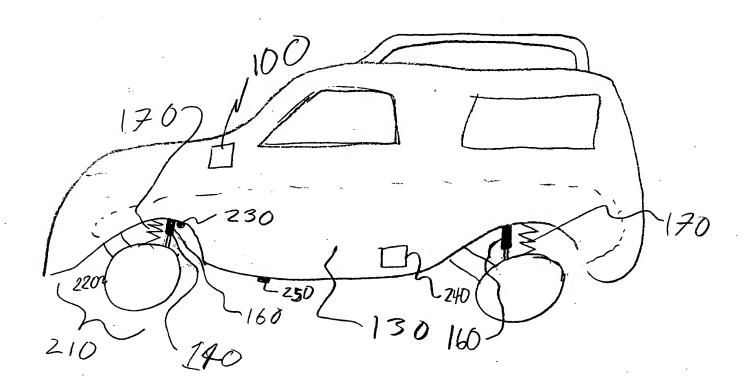


Fig. 2

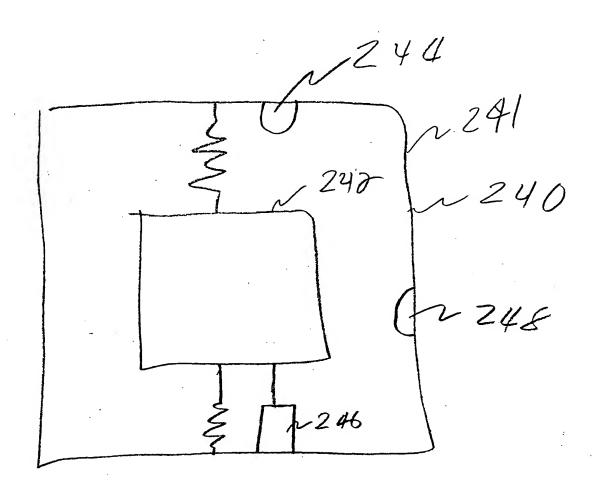


Fig. 3

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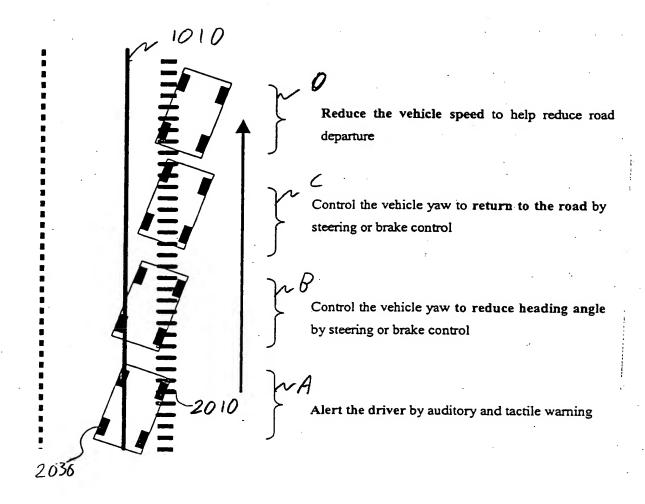
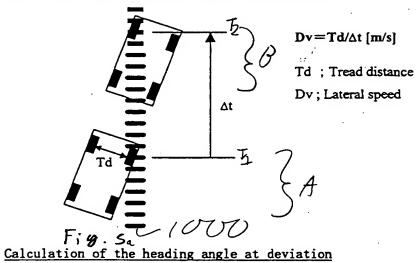


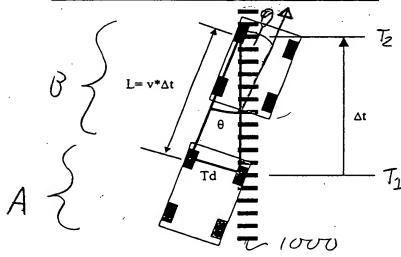
Fig. 4

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Calculation of the Lateral speed at Deviation





 $\tan\theta = Td/L = Td/(v^{\star}\Delta t)$

Td; Tread distance v ; Vehicle Speed

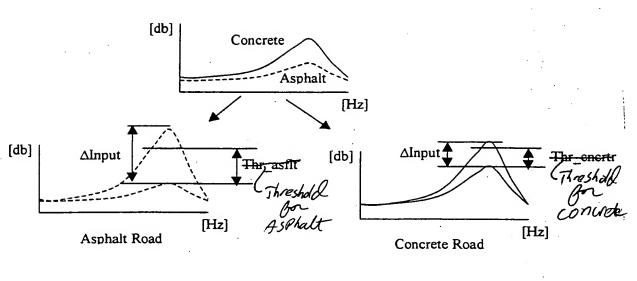
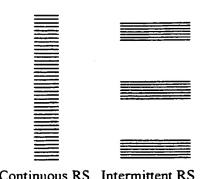


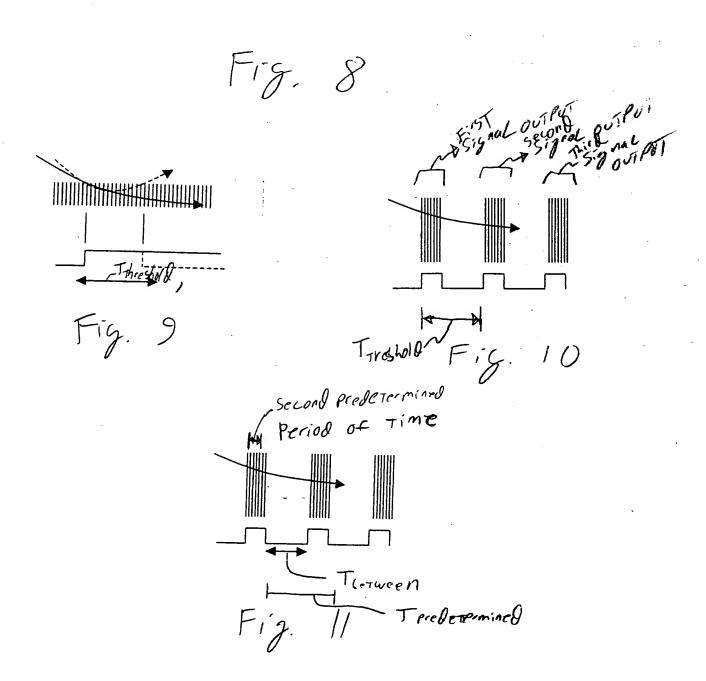
Fig. 6

Input peak frequency changes depending on road types as well as the v ehicle sneed [db] Concrete. Asphalt [Hz] Band-Pass-Filter for asphalt roads Band-Pass-Filter for concrete roads db dЪ Hz Hz Low speed -Low speed Mid. Speed Mid. Speed db High speed db High speed Hz Hz

Fig. 7

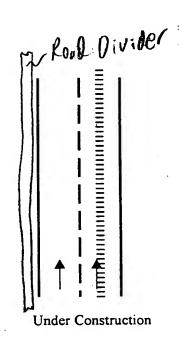


Continuous RS Intermittent RS



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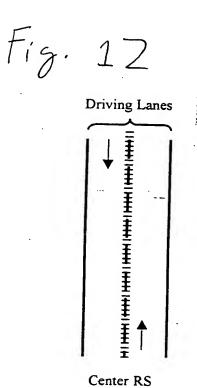


Fig. 13

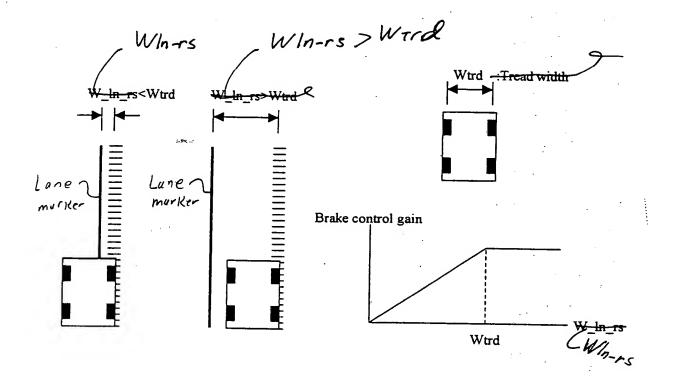


Fig. 14

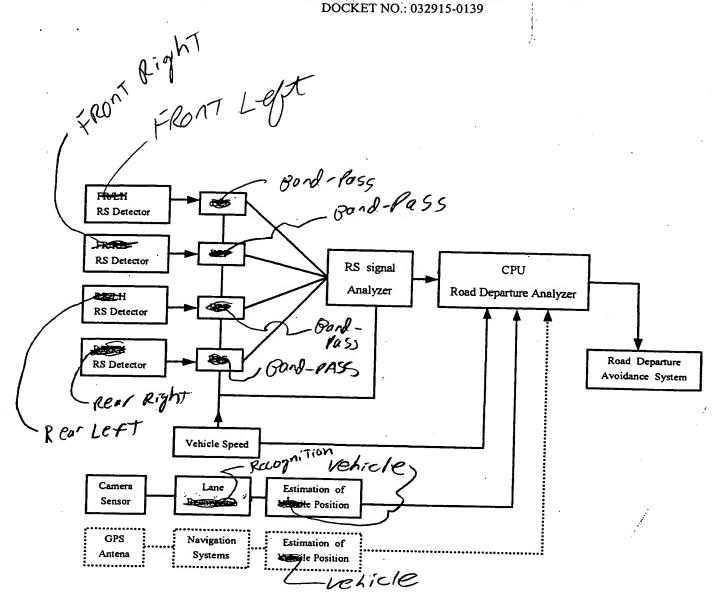
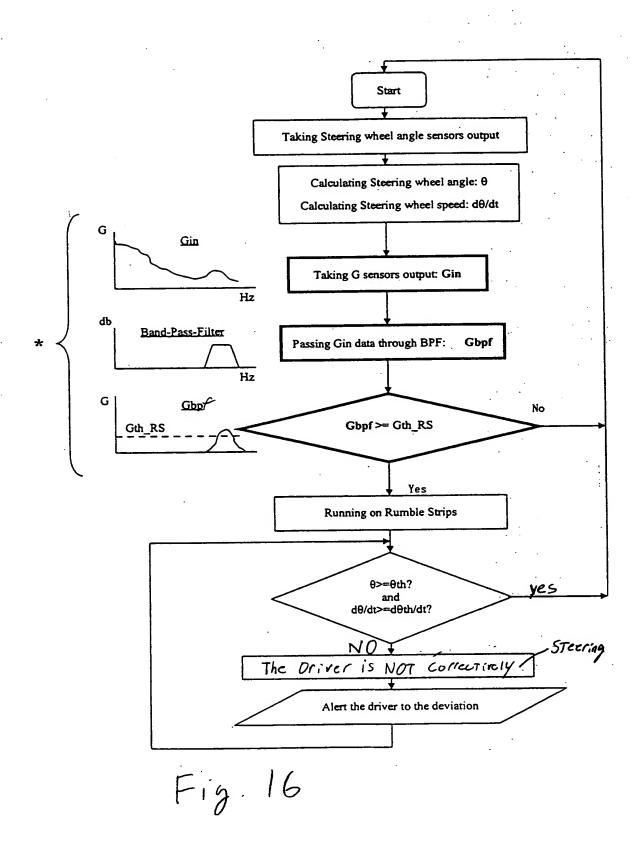
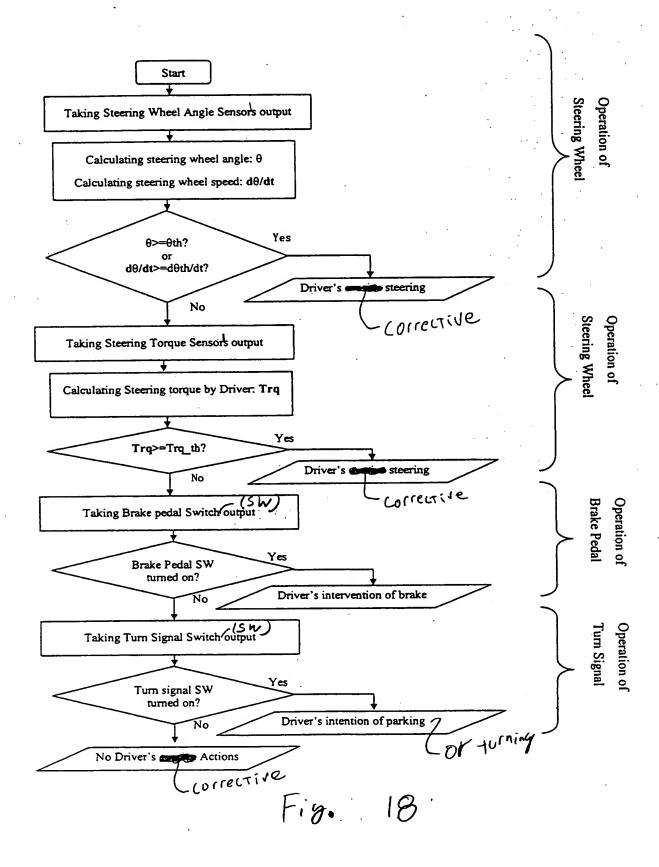


Fig. 15



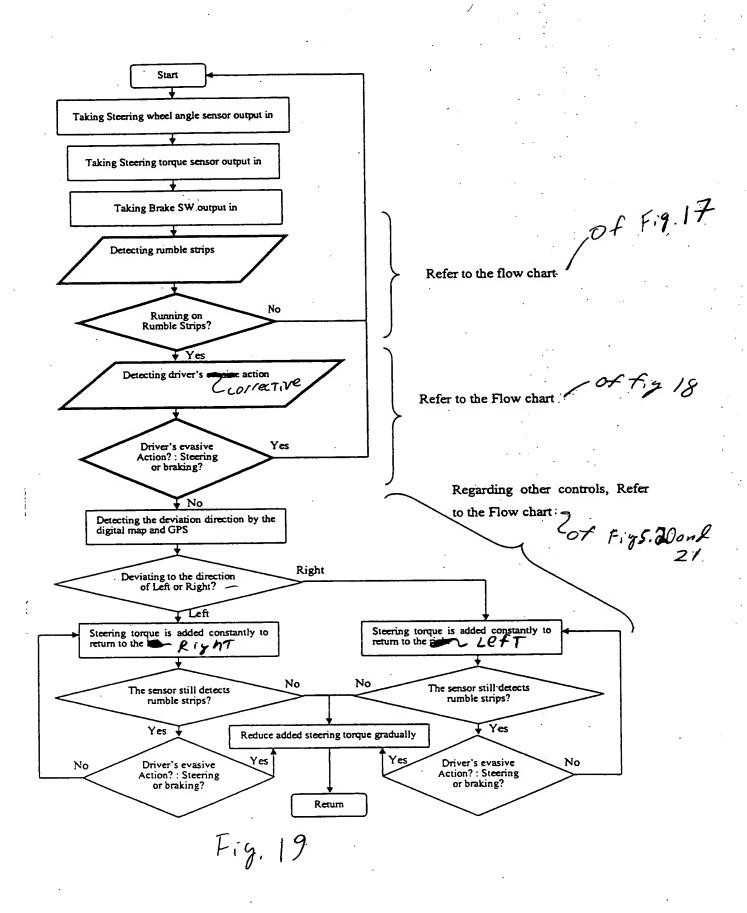
RESPONSE Cut-off frequencies of Band-Pass Filter in region to vehicle speed The pattern of rumble strips: cycle distance; 30.48cm (1foot) 140~ km/h 128 Hz BPF#1 120-140km/h 109 Hz BPF#2 100~120km/h 91 Hz BPF#3 80~100km/h 72 Hz BPF#4 60~80km/h 55 Hz BPF#5 Start đЫ Band-Pass-Filter #5 Gin Taking G sensor output: Gin Hz db G Band-Pass-Filter #4 Taking Vehicle Speed Hz db. Select BPF#1~#5 Band-Pass-Filter #3 Hz Passing Gin through selected BPF#x db Band-Pass-Filter #2 **Gbpf** Gbpf>= Gth_RS? Gth_RS db Band-Pass-Filter#1 Ηz Running on Rumble Strips Hz

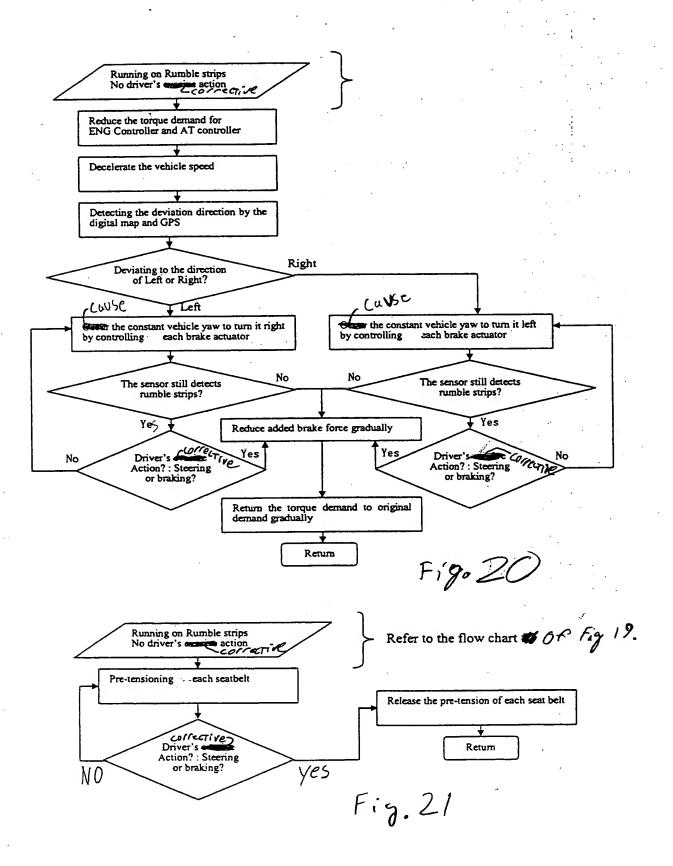
Fig. 17



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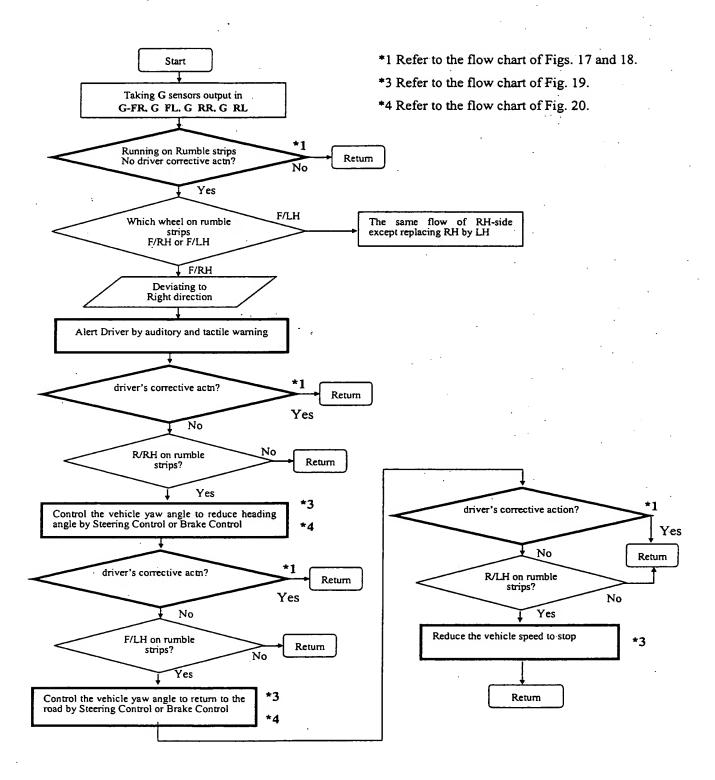


Fig. 22

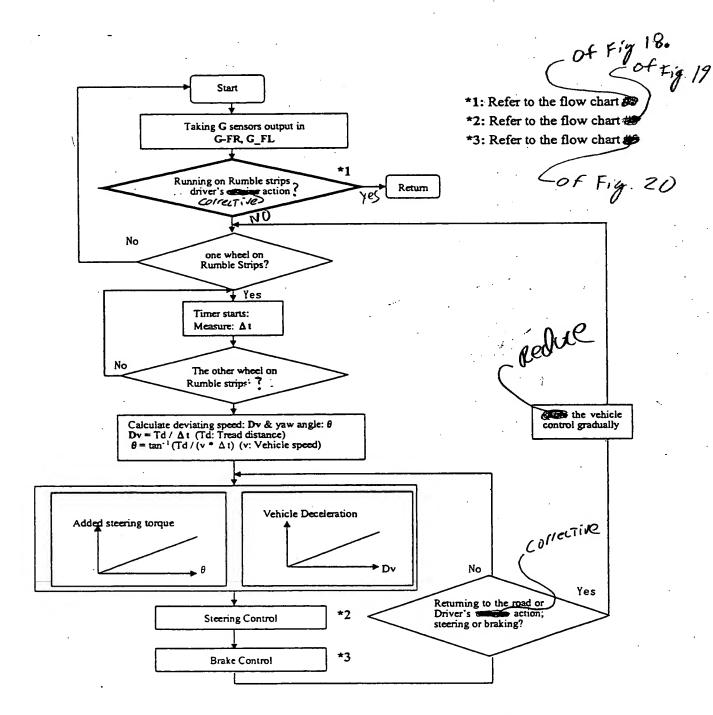


Fig. 23

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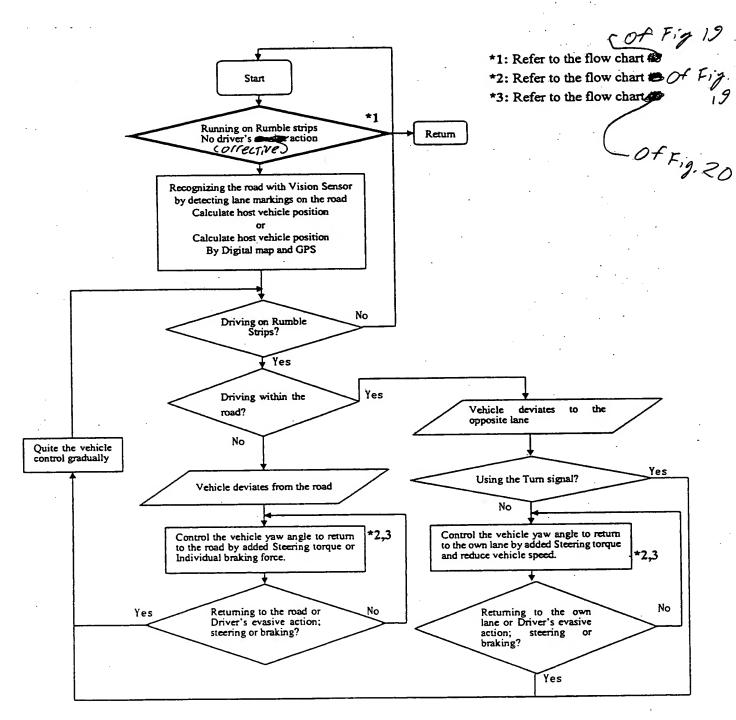
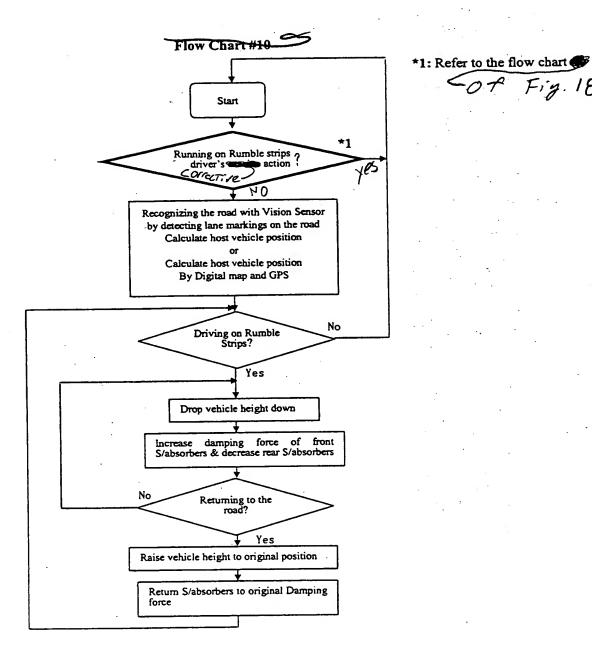


Fig. 24

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COP Fig. 18

Fig. 25